

BELLCOMM, INC.

SUBJECT: Trip Report - Report by Martin  
Company on AAP Tethering Study,  
May 19, 1967 - Case 600-3

DATE: June 2, 1967

FROM: J. Kranton

MEMORANDUM FOR FILE

A meeting was held at MSFC on May 26th at the request of the Martin Company to ask NASA for direction in their tethering study. (1) The spokesman for Martin was H. Harvey, with support from J. Coan, T. Glahn, and R. Wilson. Making decisions for NASA was Fred Vruels.

Martin's requests of NASA were essentially these:

1. Decide on the boom design for the LM/ATM Cluster hard tether operation.
2. Decide on a method of attaching a flexible tether between the LM/ATM and Cluster.

HARD TETHER

Martin has evaluated seven candidate mechanizations for a hard tether. The details of this evaluation are contained in a report, a copy of which is available from the author. Martin's recommendation, with which NASA concurred, was to use an unfurlable boom made of flat plates seam welded together and expanded to a round cross section. The tube is pressed flat by rolling on a drum; when unrolled, the tube "springs back" to a round cross section. This concept was developed by Ryan Engineering for NASA under another contract. The estimated weight for a 100 foot boom 10 inches in diameter is less than 200 lbs, including drive motor.

FLEXIBLE TETHER

Martin's study has focussed on slack tether modes, which the relative velocities between the LM/ATM and Workshop are

(NASA-CR-154345) TRIP REPORT: REPORT BY  
MARTIN COMPANY ON AAP TETHERING STUDY, 19  
MAY 1967 (Bellcomm, Inc.) 2 p

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See, Anderson, G. M., Trip Report - Martin Company Internal  
Report on Tethering Study. Memorandum for File May 10, 1967.

FACILITY FORM 602

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adjusted by tugging on the tether. Surprisingly, Martin at this late date, has not been informed of MSFC's work in this area by B. S. Perrine.<sup>(2)</sup> This point notwithstanding, Martin's conclusion is that, in order to determine when to tug on the tether and how much, accurate in-flight calculation is required of the relative motion between the LM/ATM and Workshop. The astronaut's eyeball is inadequate for this job so that implementation of the mode will require use of rendezvous radar and LM guidance computer.

Compared to the hard tether, the flexible tether is unattractive. Mr. Vruels directed Martin to complete their study with the hard tether on the "front burner".

#### NOTEWORTHY ITEMS


Mr. Vruels requested that Martin analyze the ramifications of gravity-gradient vs. inertial stabilization of the Workshop with LM/ATM on a hard tether. In particular, he referred to the interrelation between the electrical power, thermal control and attitude control problems. Martin consented to Mr. Vruels' request.

Martin, with the approval of Mr. Vruels, is evaluating the quasi-inertial mode.

A final report on the Martin study is due in early July.

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<sup>(2)</sup>Mr. Perrine's work is described in: Kranton, J., Tether LM/ATM Modes for AAP 3/4, Memorandum for File, April 10, 1967.